Space Network Ground Segment Sustainment Program
Code 454
STATEMENT OF WORK (SOW)

EFFECTIVE: TBD

Goddard Space Flight Center
Greenbelt, Maryland

TDRS SGSS PROJECT
STATEMENT OF WORK (SOW)

DOCUMENT CHANGE RECORD

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1 Introduction

1.1 Purpose

This Statement of Work (SOW) defines the Contractor's efforts required to implement the Space Network Ground Segment Sustainment (SGSS) Project. The Space Network (SN) consists of a space segment, the Tracking and Data Relay Satellites (TDRS), and a ground segment (SNGS). The SN provides the capability for global space-to-ground telecommunications and tracking coverage for Low Earth Orbit (LEO) and near-earth spaceflight missions, including both robotic and human space flight. The SNGS includes facilities and systems located at the White Sands Ground Terminal (WSGT) and the Second TDRS Ground Terminal (STGT), Las Cruces, NM, the Guam Relay Ground Terminal (GRGT), Guam, and SNE East, Blossom Point, MD.

The purpose of the SN Ground Segment Sustainment (SGSS) project is to implement a modern ground segment that will enable the SN to continue to deliver high quality services to the SN community, meet stakeholder requirements and significantly reduce required operations and maintenance resources. This effort will address obsolescence of the existing systems, create a more flexible and organic architecture to address evolving customer requirements and advances in technology, implement new methods and capabilities for using the TDRS to support customer spacecraft, expand and improve the methods by which the customer control centers interface with the SNGS for data and service planning and control, and maintain long-term operational performance, reliability and maintainability.

1.2 Scope

This Statement of Work (SOW) defines those tasks to design, analyze, validate, develop, fabricate, assemble, integrate, checkout, test, evaluate, verify, deliver, transition, document, and support operations and maintenance of the SN Ground Segment Sustainment System and its interfaces.

1.3 SGSS General Requirements

[SOW 100] The Contractor shall provide all of the management and engineering services, personnel, services, materials, equipment, and facilities required for the successful and on-time implementation of the design, analyses, engineering, development, integration, test, engineering data analyses, validation, qualification, delivery, installation, transition, training, period of performance maintenance, and sustaining engineering of the SGSS and its interfaces in accordance with the Level Three Requirements, Contract Data Requirements list (CDRL), and all applicable documents as specified in Attachment J.

[SOW 647] The contractor shall provide all data and documentation deliverables in accordance with the SGSS Contract Data Requirement List (CDRL).

[SOW 101] The work shall include providing or developing all hardware and software tools or facilities and ground support equipment required to complete these tasks, including any

equipment necessary to complete operational testing which is not available at SN ground facilities and systems.

[SOW 102] The Contractor shall also design, document, and verify any changes required to the existing Space Network ground facilities and remote systems required to meet the SGSS requirements.

[SOW 103] Any changes made by the Contractor to SN ground facilities and systems shall not adversely impact the ongoing operations of the SN.

1.4 SN Ground Segment Sustainment System Deliverable

[SOW 550] The SGSS Ground System shall meet all Level Three Requirements.

[SOW 551] The Contractor shall deliver a Configuration Item Identification List (CIIL) (CDRL CM-05).

[SOW 552] The Contractor shall deliver fully operational SGSS systems to the White Sands Complex (WSC) and to Guam Relay Ground Station.

[SOW 553] The Contractor shall deliver a fully operational Maintenance Training Facility (MTF) to the WSC.

[SOW 554] The Contractor shall deliver an SGSS interface to SNE East at Blossom Point, MD.

[SOW 548] The Contractor shall deliver the spares defined and approved in the Technology Refresh and Sparing Plan (CDRL SE 25).

[SOW 555] The Contractor shall deliver all developed source code, executable code, and for all COTS products media, licenses and associated documentation.

2 Definitions, Terms and References

2.1 Definitions and Terms

The following definitions apply to this document:

Shall – Compliance by the Contractor is mandatory. Any deviation from these contractually imposed mandatory requirements requires the approval of the contracting officer.

May – At the discretion of the Contractor or Government.

Will – Designates the intent of the Government. Unless required by other contract provisions, noncompliance with the *will* requirements does not require approval of the contracting officer and does not require documented technical substantiation.

The term "(CDRL -)" refer to items in the Contract Deliverable Requirements List (CDRL).

Throughout this document, the term "Government personnel" includes anyone designated by the SGSS Project Manager to act on behalf of the Government.

2.1.1 To Be Supplied (TBS)

The term "(TBS)"means, "To Be Supplied", identifies missing or incomplete information, values, or data needed to fulfill a requirement. The Government will furnish values for items identified by a TBS. The Government will provide a date or milestone for each TBS requirement.

2.1.2 To Be Resolved (TBR)

The term "(TBR)" means, "To Be Resolved". Requirements marked "TBR" contain unknown values or options. These values will be resolved by joint action of the Contractor and the Government.

[SOW 556] The Contractor shall propose draft values and rationale for all TBR requirements by System Requirements Review (SRR).

[SOW 557] The Contractor shall provide final values and rationale for all TBR requirements by Critical Design Review (CDR).

[SOW 558] The Contractor shall not proceed with TBR requirements implementation until receiving concurrence and approval from the Government.

2.1.3 To Be Determined (TBD)

The term "(TBD)" is an acronym for "to be determined" and identifies a missing requirement.

[SOW 648] The contractor shall recommend resolutions and provide associated justifications for such recommended resolutions for all TBDs.

[SOW 649] The contractor shall coordinate all TBD resolution recommendations with the Government.

[SOW 650] The contractor shall request and receive approval from the Government before proceeding with its TBD resolution recommendation.

2.1.4 Level Three Requirements

The term "Level Three Requirements" (or "L3 Requirements") refers to the Government-controlled requirements for this contract. The Level Three Requirements for this contract are:

(1) SGSS System Requirements Document (SRD)
(2) SGSS Mission Assurance Requirements (MAR)
(3) SGSS Verification and Validation Plan
(4) SN External Interface Control Documents
(5) SN External Interface Requirements Documents

2.2 Order of Precedence

[SOW 651] Any inconsistency in this solicitation or contract shall be resolved in accordance with Contract Clause 52.215-8 Order of Precedence.

[SOW 652] Any inconsistency in other documents, exhibits, and attachments shall be resolved by giving precedence in the following order:

a) The SGSS Statement of Work
b) The SGSS System Requirements Document (SRD)
c) SN External Interface Control Documents
d) SN External Interface Requirement Documents
e) Other exhibits and attachments included in Section J
f) The Applicable Documents (see 2.3)
g) The Reference Documents (see 2.4)

[SOW 653] In the event of conflict between terminology in this solicitation and any other dictionary, the SGSS terminology shall take precedence.

[SOW 654] In the event of any unresolved conflict, the Contractor shall request conflict resolution by the Contracting Officer.

2.3 Applicable Documentation

The following documents are included in this Statement of Work as requirements. Documents are the effective versions as of the date of Request for Proposal (RFP) release. They are listed in order of precedence. In the event of conflict between these applicable documents and specific requirements of this SOW, the SOW shall be the superseding document.

a.	SGSS TBD	SGSS System Requirements Document (SRD)
b.	SGSS TBD	SGSS Mission Assurance Requirements (MAR)
c.	SGSS TBD	SGSS Verification and Validation Plan
d.	SGSS TBD	SN External Interface Requirements Documents
e.	SGSS TBD	SN External Interface Control Documents
f.	GPR 1060.2	Management Review and Reporting for Programs and Projects
g.	GPR 1410.2C	Configuration Management
h.	GPR 1600.1	Security Requirements
i.	GPR 5100.4	Supplier Quality Audits
j.	GPR 7120.4	Risk Management
k.	GPR 7120.5A	Systems Engineering
l.	GPR 8700.4	Integrated Independent Reviews
m.	GPR 8700.6A	Engineering Peer Reviews
n.	NPD 8010.2	Use of the SI (Metric) System of Measurement in NASA Programs
o.	NPD 8730.2C	NASA Parts Policy
p.	NPR 1600.1	NASA Security Program Procedural Requirements
q.	NPR 2190.1	NASA Export Control Program
r.	NPR 2810.1A	Security of Information Technology

s. NPR 2830.1 NASA Enterprise Architecture Procedures
t. NPR 5100.4 Federal Acquisition Regulation Supplement
u. NPR 7123.1A Systems Engineering Procedural Requirements
v. NPR 7150.2 NASA Software Engineering Requirements
w. NPR 7120.5D NASA Space Flight Program and Project Management Requirements
x. NPR 8000.4 Risk Management Procedural Requirements
y. NPR 8705.6 Safety and Mission Assurance Audits, Reviews, and Assessments
z. NPR 8715.3A NASA General Safety Program Requirements
aa. NPR 8820.2E Facility Project Implementation Guide
bb. NPR 8820.2F Facility Project Requirements
cc. NPR 8831.2D Facilities Maintenance Management
dd. NPR 9501.2D NASA Contractor Financial Management Reporting

ee. NASA-STD-8739.8 Software Assurance Standard.
ff. NASA-STD-8719.13 NASA Software Safety Standard
gg. NISN 700-DOC-029 NASA Integrated Services Network (NISN) Internet Protocol Operational Network (IONet) Security Policy
hh. ANSI/EIA-748-A EIA Standard for Earned Value Management Systems, 28 Aug 2002.
ii. ANSI/ISO/ASQ Q9001:2000 American National Standard Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation and Servicing.
jj. Homeland Security Presidential Directive (HSPD) 12
kk. National Industrial Security Program Operating Manual (NISPOM)
ll. NASA Space Network Security Classification Guide
mm. DoD 5220-22M, National Industrial Security Program Operating Manual (NISPOM)

2.4 Reference Documentation

The following documents are included in this Statement of Work as reference and information.

a. NASA COMSEC Standard Operating Procedures (CSOPs)
b. Federal Information Processing Standards (FIPS) Publication (PUB) 199
c. Federal Information Processing Standards (FIPS) Publication (PUB) 200

3 Project Management

This section describes the project management duties.

3.1 Program Management Office

[SOW 106] The Contractor shall maintain a program management office to manage the technical activities and resources of the SGSS project.

[SOW 107] The Contractor's program management office shall be fully responsible for the overall technical performance, resource management, and schedule control of the contractual effort and all subcontracts.

[SOW 108] The Contractor shall appoint a dedicated Project Manager through Final Acceptance

Review (FAR) to direct and manage the SGSS project.

[SOW 109] The Contractor's Project Manager shall have responsibility for the overall technical performance, resource management, and schedule management of the contractual effort and all subcontracts.

[SOW 110] The Contractor's Project Manager shall report to a level of company management appropriate to ensure prompt resolution of all problems.

[SOW 111] The duration of Project Management shall be until Final Acceptance Review (FAR).

[SOW 112] The Contractor shall prepare a Project Management Plan (CDRL PM-01) and an Organizational Conflict of Interest Avoidance Plan (CDRL PM-13).

3.2 Resource and Cost Management

[SOW 113] The Contractor shall establish, implement, and maintain a comprehensive resource management system for planning, authorizing, and controlling the total resources effort for each task and for providing visibility into manpower and schedule performance.

[SOW 583] The Contractor shall establish, implement, and maintain a comprehensive cost management system for planning, authorizing, and controlling the total expenditures for each task and for providing visibility into cost performance.

[SOW 584] The Contractor shall prepare and submit supporting Cost Analysis Data Requirement (CADRe) data (CDRL PM-19) as scheduled for all Critical Milestone Reviews (see 3.13.3 Critical Milestone Reviews).

[SOW 585] The Contractor shall prepare and submit NASA 533Q Reports quarterly and NASA 533M Reports monthly in accordance with Financial Management Reports (CDRL PM-12).

[SOW 586] The Contractor shall prepare and submit Bi-Weekly Status Reports as described in (CDRL PM-07).

3.3 Schedule Management

[SOW 114] The Contractor shall establish, implement, and maintain an integrated scheduling system consistent with their corporate procedures and documented in the Project Management Plan (CDRL PM-01)

[SOW 115] The Contractor shall provide and maintain an Integrated Master Schedule (CDRL PM-03).

[SOW 116] The Contractor shall obtain approval from the Government prior to changing the IMS baseline.

3.4 Contract Management

[SOW 117] The Contractor shall provide the necessary resources for monitoring, controlling, executing, and administering the SGSS contract and subcontracts to ensure compliance with all contractual requirements.

3.4.1 Subcontract Management

[SOW 118] The Contractor shall ensure that adequate technical, cost, and schedule oversight of subcontractors is established and maintained.

[SOW 119] The Contractor shall ensure that all program, technical, insight, and mission assurance requirements are flowed to subcontracts with a period of performance greater than one year or greater than $25M value, or that have been assigned critical tasks (as determined by the Government).

[SOW 414] The Contractor shall prepare a Subcontract Management Plan (CDRL PM-04).

[SOW 120] The Contractor shall report the status of all subcontracts at each Monthly Program Status Review (MPSR).

[SOW 121] The Contractor shall establish appropriate inspection and acceptance testing of subcontractor deliverables.

[SOW 122] The Contractor shall ensure that subcontractors have established acceptable programs for parts and materials, quality assurance, and configuration management.

[SOW 415] The Contractor shall periodically audit all subcontractors to ensure that the subcontractors are conforming to the Subcontract Management Plan (CDRL PM-04).

[SOW 416] Any issues or problems with subcontractor performance shall be tracked via the Discrepancy Report (DR) system and reported at MSPRs.

[SOW 523] The Contractor shall make available to the Government all information necessary to determine that the Contractor is in compliance with the Subcontract Management Plan (CDRL PM-04).

3.4.2 Earned Value Management

[SOW 123] The Contractor shall apply the principles and processes of Earned Value Management to provide effective and objective technical, schedule, and cost performance measurement.

[SOW 124] The Contractor shall implement an Earned Value Management System that complies with the Industry Guidelines for Earned Value Management Systems (ANSI/EIA-748-A).

[SOW 418] The Contractor shall prepare an Earned Value Management System (EVMS) Plan in accordance with (CDRL PM-10).

[SOW 125] The Contractor shall establish the initial Performance Measurement Baseline (PMB) as soon as possible after contract award, but no later than 90 days thereafter.

[SOW 515] The PMB shall cover the entire technical scope of the work on the contract and shall include realistic schedules integrated with the appropriate resources required to accomplish all of the related tasks.

[SOW 126] The PMB and other Integrated Baseline Review (IBR) data will be in accordance with CDRL PM-11 and shall be presented and reviewed at the IBR.

[SOW 127] The Contractor shall obtain prior approval from the Government before adjusting contractual milestones, establishing Over Target Baseline (OTB), or implementing a Single Point Adjustment (SPA).

[SOW 128] The Contractor may adjust cost performance data (Planned Value (PV), Earned Value (EV), or Actual Costs (AC) from prior months only for (a) the correction of administrative errors, (b) routine accounting adjustments, or (c) customer-directed changes. All such prior months adjustments must be implemented in the current month and addressed in that month's Contract Performance Report (CPR) Format 5 narrative.

[SOW 129] The Contractor shall flow down EVM requirements to all subcontracts with a period of performance greater than one year and greater than $25M value or that have been assigned critical tasks, as determined by the Government.

[SOW 419] The Contractor shall ensure that those subcontracts report their monthly data for consolidation in the CPR submitted to the Government.

[SOW 420] The Contractor shall be responsible for reviewing and assuring the validity of all subcontractors reporting through surveillance and other means.

[SOW 130] The Contractor shall provide monthly Contract Performance Reports (CPR) (CDRL PM-09).

3.5 Risk Management

[SOW 131] The Contractor shall establish and maintain a Continuous Risk Management (CRM) process.

[SOW 133] The Contractor shall document the project-specific implementation of the CRM process in a project-specific Risk Management Plan (RMP) (CDRL PM-14). Preparation of the RMP is a requirement established by NPR 7120.5 and includes the content shown in NPR 8000.4, "Risk Management Procedural Requirements."

[SOW 135] The Contractor shall generate and maintain a Risk Report (CDRL PM-15) that is presented and reviewed at all Monthly Project Status Reviews (MPSRs) and at Critical Milestone Reviews.

[SOW 525] The contractor shall establish and maintain a risk database that contains at a minimum a unique risk identifier, risk title, risk description, risk owner, probability and impact, timeframe (in which action need to be taken before risk is manifested into a problem), handling strategy, mitigation plans (including burn down goals) and status.

3.6 Configuration Management

[SOW 138] The Contractor shall perform configuration management (CM) in accordance with GPR 1410.2C, Configuration Management, in support of the SGSS project.

[SOW 139] The Contractor shall develop and deliver the Configuration Management Plan (CDRL CM-01).

[SOW 628] The Contractor shall establish a Configuration Change Board (CCB).

[SOW 141] The Contractor shall maintain configuration of all SGSS deliveries/releases and all other deliverable items throughout all phases of development and test until final acceptance.

[SOW 142] The Contractor shall perform and document configuration verification as sub-systems are incorporated into higher-level systems and at major Project milestones.

[SOW 592] No controlled items shall be changed without a CCB-approved Engineering Change Request (CDRL CM-09).

[SOW 524] The CM system shall have two classes of ECRs:

- Class 1 changes are defined as changes that impact mission requirements, system safety, cost, schedule, single point failures, and external interfaces.
- All other changes are considered to be Class 2 changes.

[SOW 143] The CM system impact assessment process shall forward all Class 1 ECRs to the SGSS Project.

[SOW 144] The Contractor shall submit for Government consideration a Waiver Request (CDRL CM-11) for any item that is found to be non-compliant with the requirements of the contract Statement of Work (SOW) and is not reworked to be compliant, or is not replaced with a compliant item.

[SOW 145] Configuration Control Board (CCB) status shall be reported at the Monthly Project Status Review (MPSR).

[SOW 546] The Contractor shall submit Configuration Control Board Minutes (CDRL CM-08) summarizing the actions of each meeting of the CCB.

3.7 Documentation and Data Management

[SOW 146] The Contractor shall develop, produce, deliver, and maintain all required documentation.

[SOW 593] The Contractor shall maintain a SGSS Document Tree that indexes all CDRL

documents (CDRL CM-02).

[SOW 147] All required documentation shall, at a minimum, be signed by the preparer, the Level 3 Work Breakdown Structure (WBS) element lead, and the program manager or a manager in the program management office who is delegated that responsibility.

[SOW 148] Contractor signatures on delivered documents shall certify review of the document for completeness, correctness, compliance with contractual requirements, proper security classification, proper ITAR/export control marking, and proper proprietary marking.

[SOW 149] The signature page shall explicitly state that signatures indicate compliance with these requirements.

[SOW 150] All Contractor and subcontractor SGSS-related documentation, data, analysis, Contractor internal communications (including email related to program technical work), schedules, and other information, whether formal or informal, deliverable or not, shall be made available to the Government upon request.

3.7.1 Electronic Access

[SOW 160] The Contractor shall provide to Government personnel remote access to a general purpose SGSS-specific electronic library.

[SOW 161] This library shall contain all completed reports, analyses, requirements documentation, internal technical memoranda, change requests and documentation, CDRLs, action items and status, Discrepancy Reports (DRs) and all other SGSS-specific documents prepared by the Contractor.

[SOW 162] The Contractor shall maintain an index of the material (updated monthly) and a search engine (updated daily) for document access.

The non-CDRL material contained in the electronic library may be in non-proprietary Contractor format.

[SOW 164] The Contractor shall include engineering drawings in this library or provide some other storage/retrieval arrangement, at their option.

[SOW 422] All contract data deliverables containing technical information shall be available as part of the on-line help function of the operational ground system.

[SOW 704] The electronic library shall provide email notification capability that allows Government representatives to receive email notifications when documents are posted or updated.

[SOW 679] The electronic library shall provide a separate area where the Government can upload documents for Contractor use.

3.8 Action Item Tracking

Action items are minor issues, problems, and clarifications that arise as part of the ongoing development and acquisition process. They do not represent new or failed requirements, but rather additional work required as part of the ongoing development process to complete an existing task or requirement.

[SOW 155] The Contractor shall develop a closed-loop action item tracking process that includes reporting, analysis, action, and closure.

[SOW 526] Action Items shall be reported in accordance with Action Item (CDRL PM-18).

[SOW 154] The Contractor shall capture all action items assigned by the review boards, at monthly meetings, technical interchange meetings, engineering peer reviews, and working group meetings.

[SOW 157] The Contractor shall provide Government access to the Contractor's action item tracking process, including the ability to remotely view and submit action items, submit comments, submit a recommended priority, and review status.

[SOW 210] The Contractor shall respond as required to action items assigned by the Government.

[SOW 430] A meeting or event that gives rise to action items shall not be considered complete until all action items have been resolved.

[SOW 527] The status of all open action items, and all action items closed since the previous report, shall be reviewed at each Monthly Project Status Review (see 3.13.5.2 Monthly Project Status Reviews (MPSR)).

3.9 Discrepancy Report (DR) Tracking

Discrepancies are significant issues or problems that are identified during the development and acquisition process. If left unresolved a discrepancy would result in a failed requirement, budget or schedule overrun or other significant program impact. A Discrepancy Report (CDRL PM-17) captures the origin and details of a discrepancy and tracks the status and corrective actions to resolve the discrepancy.

[SOW 431] The Contractor shall use a closed-loop Discrepancy Report (DR) tracking process that includes reporting, analysis, action, and closure.

[SOW 655] The Contractor shall establish a Discrepancy Review Board (DRB).

[SOW 656] The Discrepancy Review Board (DRB) shall include representatives from System Engineering, Program Management, discipline engineering, Quality Assurance and Mission Assurance.

[SOW 657] A Discrepancy Report shall not be closed until the resolution is reviewed and approved by the Discrepancy Review Board (DRB).

[SOW 436] Program discrepancies shall be reported in accordance with Discrepancy Report (CDRL PM-17).

[SOW 637] The DR tracking process shall have the ability to filter reports based upon source, severity, status, keyword, element, and module.

[SOW 432] The Contractor shall capture all discrepancy reports that arise from internal processes as well as from the Government.

[SOW 433] The discrepancy tracking process shall include: a protocol to review past performance to determine the incidence of identical or related discrepancies, an escalation procedure (to inform higher levels of management and the Government) based on mission criticality, and a closeout process for root cause determination, anomaly mitigation, and recurrence control.

[SOW 434] The Contractor shall provide Government access to the Contractor's discrepancy tracking process, including the ability to remotely view and submit problems (discrepancy reports), submit a recommended priority for action, and review discrepancy status.

[SOW 646] Each discrepancy report shall include a severity from I to IV as defined here:

Severity category	**Definition**
I	Critical: A discrepancy that prevents test team progress or operational use of the SGSS system, or that has direct impact upon the milestone schedules. Discrepancies that prevent the use of a build or release; no work-around is possible or practical.
II	Urgent: A discrepancy that prohibits successful completion of one or more test variations, but is not currently affecting schedules. An operational discrepancy that can be temporarily handled procedurally, but has an adverse effect on the system. Discrepancies that are serious but that do not prevent using or testing a required capability.
III	Routine: A discrepancy that does not prohibit successful completion of a test. This category involves minor deviations from task or project standards
IV	All other discrepancies

[SOW 435] Severity I and II discrepancy reports shall not be considered resolved until the Government has reviewed and assented to the resolution (see 3.13.5.2 Monthly Project Status Reviews (MPSR)).

3.10 Government Insight

[SOW 169] The Contractor shall open to Government attendance all Contractor and subcontractor internal data, reviews, audits, meetings, tests and other activities within the scope of the contract.

[SOW 170] The Contractor shall allow and enable the use of Non-Disclosure Agreements with Government representatives where appropriate.

[SOW 171] The Contractor shall notify the Contracting Officer, the Government Resident Office and the Contracting Officer's Technical Representative (COTR) of meetings, reviews, dry runs, rehearsals or test events at least 10 working days prior to the event.

3.10.1 Government Visitor Support

[SOW 172] The Contractor shall provide facilities to support six (6) simultaneous Government representatives at all development sites, including office space, telephones, and network access to the Contractor's electronic database, from contract award through Final Acceptance Review (FAR).

[SOW 680] During major reviews, the Contractor shall provide temporary facilities (including work space, telephones, and broadband network access) to support ten (10) additional Government representatives.

[SOW 173] The Contractor shall allow the government representatives to bring government or support Contractor-owned computers, mobile phones, and personal digital assistants (PDAs) into the office space provided.

[SOW 174] The Contractor shall provide within this office space high-speed (broadband) Internet access.

[SOW 175] The systems provided for visiting representatives shall include the capability to print from their notebook computers.

[SOW 528] The Contractor shall provide badges, car passes, computer passes, and any other required badging for independent entry and exit to the Contractor's facilities for Government representatives as necessary.

[SOW 176] All badging shall be valid for at least 12 months before revalidation is required.

[SOW 177] If the Contractor requires training for entry into any facilities, the Contractor shall provide the necessary training to government representatives.

[SOW 178] The training requirements for government representatives shall not exceed that required of the Contractor's employees.

[SOW 179] This training shall be provided to government representatives within two weeks of initial request.

[SOW 180] Government representatives shall include government employees or technical support contractors, including but not limited to project management, technical and engineering staff, and operations personnel.

3.11 Contractor Visitor Support

The Government will provide office space, furniture, facilities, networked printers, copier access, facsimile machine access, phones, and broadband access to the Internet at WSC beginning 6 months (TBR) after contract award for at least 4 (TBR) Contractor personnel for the purpose of site survey, coordination with O&M personnel, installation coordination, Configuration Control Board (CCB) participation, and facilitating on-site activities with the Government representatives.

[SOW 706] The contractor shall provide resident management and engineering/technical support personnel at WSC starting 1 month (TBR) before the first Pre-Ship System Acceptance Review (SAR) and continuing through the end of the contract period of performance.

[SOW 707] The on-site support personnel shall have at least one year's experience of active participation in the development of SGSS.

[SOW 708] The on-site resident support shall be responsible for the following types of functions:

- Operational integration of SGSS with other site systems
- Assistance in planning and implementing changes or enhancements to SGSS
- Technical assistance in resolving operational problems
- Technical assistance in resolving problems encountered during the development of software
- Assistance in the areas concerning system optimization, system utilization, and use of software development tools provided under this contract
- Assistance in resolving user problems
- Installation of the latest releases of system software and software support tools provided under this contract
- Performing implementation planning, plan updates, coordination, and problem resolution activities necessary to successfully execute the I&T, Transition, and Operations Support activities

3.12 Program Security

Government program security requirements are conveyed through the contract and applicable documents as listed in 2.3.

[SOW 181] The Contractor shall be responsible for employee awareness and compliance with program security requirements.

[SOW 197] The Contractor shall treat the SGSS as a "high-impact" resource for system security and system information purposes as outlined in Federal Information Processing Standards (FIPS) Publication (PUB) 199 and FIPS PUB 200.

[SOW 182] The Contractor shall comply with government requirements for industrial, physical, program, personnel, counterintelligence/counterterrorism, and information/information technology security and asset protection during all program phases and at all locations where program work will be performed, including the Contractor's and subcontractor's facilities,

during transportation and while at the installation site.

[SOW 626] The Contractor shall provide a Program Security Plan (CDRL PS-09) that details how they plan to address the Operational Security (OPSEC), Physical, Information/IT (as it relates to the protection of NASA Sensitive But Unclassified information), Personnel, Communications Security (COMSEC) and Industrial Security of the SGSS System and their development facilities.

[SOW 195] Any deviations or waivers to the contract security requirements shall be approved by NASA prior to submission to the cognizant agency.

[SOW 193] Security violations shall be reported to the NASA Director, Security Management Division within 48 hours.

[SOW 194] Defense Security Service (DSS) or other government agency findings or direction applicable to Program activities shall be reported to NASA monthly.

3.12.1 Security Plans and Accreditation

[SOW 196] The Contractor shall prepare, submit, and implement an IT System Security Plan (CDRL PS-01).

[SOW 198] The Contractor shall accomplish, document, and submit an IT System Security Assessment (CDRL PS-02).

[SOW 618] The Contractor shall accomplish, document, and submit an IT Security Risk Assessment (CDRL PS-03).

[SOW 199] The Contractor shall prepare, submit, and implement an IT Contingency Plan (CDRL PS-04).

[SOW 200] The Contractor shall support SGSS Certification and Accreditation (C&A) activities and prepare documentation (CDRL PS-05) in accordance with NASA Procedural Requirements (NPR) 2810.1A, Security of Information Technology, Section 14.

[SOW 201] The Contractor shall support the Government's security assessment team (security IV&V) during C&A testing.

[SOW 622] The Contractor shall support SGSS Interconnection Security Agreement activities and prepare documentation (CDRL PS-06) in accordance with NASA Procedural Requirements (NPR) 2810.1A, Security of Information Technology, Section 9.2.

3.12.2 Personnel

[SOW 183] The Contractor shall maintain a list of personnel (active and inactive) performing work on the SGSS Project and their status with respect to government and contract security screening requirements.

[SOW 184] This list shall be auditable by the government.

[SOW 188] All personnel with access to program technical data, hardware, software, operational areas, or operations products, shall require a positively adjudicated DoD collateral Secret clearance.

[SOW 520] All personnel with access to White Sands Complex (WSC) shall have US citizenship. Personnel with access to SN sites may not hold dual citizenship.

3.12.3 Access

[SOW 185] All access by Foreign Nationals to controlled areas or systems where SGSS Project work is being performed shall be approved by NASA in advance.

[SOW 186] Program technical data, flight hardware, software, I&T facilities, operations areas, and operations products shall be protected per NASA and government requirements as defined in the applicable documents as listed in 2.3.

[SOW 187] Access to these articles/areas shall be limited to personnel working the program and cleared per program requirements.

[SOW 189] Access to program information and work areas shall be positively controlled and auditable.

[SOW 203] The Contractor shall obtain all required access authorizations and submit any paperwork required for the Contractor to access Government controlled facilities.

[SOW 522] All Contractor personnel with access to Space Network ground sites shall maintain a DOD Secret clearance unless NASA authorizes a specific exception.

[SOW 204] The Contractor shall allow access by the Government to all Contractor facilities used by SGSS.

[SOW 521] The Contractor shall obtain GSFC Chief of Security Code 240 approval for all access to foreign locations. This does not apply to the U.S. territory of Guam.

3.12.4 Classification and Marking

[SOW 190] Program Documentation shall be classified and marked in accordance with applicable Security Classification Guides and Export Control Requirements.

[SOW 191] The following program information and data shall be marked and handled as NASA Sensitive But Unclassified (SBU):

1. Ground Software code and images and design documents/information.
2. Operational Procedures and design information, to include databases.
3. System Design and Operational Description information.
4. System/Element/Unit Level performance analyses.
5. Security Plans and Implementation documents, including program access lists
6. Any system vulnerabilities not classified at higher levels.

7. Any information related to the COMSEC design or implementation not classified at higher levels.

[SOW 192] The Contractor shall maintain a list of classified documents generated or held by the program.

[SOW 153] Classified documentation shall be appropriately marked at the time of generation.

[SOW 151] Proprietary markings shall be applied only to pages of documents and/or data which contain actual proprietary information, whether formal or informal, deliverable or not.

[SOW 152] All pages of program data which contain ITAR/export control data shall be marked properly at the time of generation of informal data or first release of formal data.

3.12.5 COMSEC

[SOW 202] The Contractor shall comply with all communication security (COMSEC) requirements related to the development, integration, and testing of SGSS capabilities.

[SOW 528] The Contractor shall implement NSA-approved Type 1 encryption and authentication in equipment/physical form.

[SOW 529] The Contractor shall review and provide input to the SGSS Key Management Plan. The Government will lead development of the SGSS Key Management Plan**.**

NSA will supply the keying material for all COMSEC units. Delivery of keying material is contingent upon NSA approval of the SGSS Key Management Plan.

[SOW 530] The Contractor shall participate in a 2 day [TBD] security indoctrination / COMSEC briefing and a splinter meeting on the COMSEC implementation and certification process, both conducted by Government security representatives and prior to significant COMSEC development.

[SOW 531] The security indoctrination / COMSEC briefing and splinter shall occur at the Contractor's facility, nominally in conjunction with Contractor SRR [TBD].

[SOW 532] The Contractor shall have demonstrated experience in integrating NSA-certified command encryption/authentication equipment.

[SOW 533] The contractor shall establish and operate a COMSEC account to support development of command encryption and authentication capabilities. (Note that a COMSEC account can be established upon completion of the security indoctrination / COMSEC briefing and splinter meeting).

[SOW 534] Any deviations or waivers to the Government COMSEC requirements or the National Security Agency's (NSA) requirements shall be approved by NASA prior to submission to the cognizant agency.

[SOW 627] All handling of SGSS Project cryptographic keying material shall require Two Person Integrity (TPI) procedures.

3.13 Reviews and Meetings

[SOW 417] The Contractor shall provide meeting minutes via email to all meeting participants in compliance with Meeting Minutes (CDRL PM-08).

[SOW 429] Within 1 day after all required meetings, the Contractor shall place meeting minutes into the electronic library (see 3.7.1 Electronic Access).

[SOW 681] The Contractor shall provide video conferencing, telephone conferencing, and Internet conferencing at the Contractor's facilities for interaction between the Contractor and the Government.

[SOW 682] Unless otherwise directed by the Government, all reviews and meetings shall be held at the Contractor's facilities.

[SOW 683] The Contractor shall provide all administrative support for reviews and meetings held at the Contractor's facility.

3.13.1 Program Kickoff Meeting

The purpose of the Program Kickoff Meeting is to introduce the Government and Contractor teams, review the Contractor's approach to developing, integrating and deploying SGSS, and to address any open issues. The Program Kickoff Meeting will be attended by approximately 40 Government personnel.

[SOW 641] The Contractor shall conduct a Program Kickoff Meeting no later than two weeks after contract award.

[SOW 642] The Program Kickoff Meeting shall be hosted at the Contractor's facility.

[SOW 705] The Program Kickoff Meeting shall include a line-by-line review of the contract schedule and clauses, Level Three Requirements, and CDRL.

3.13.2 Integrated Baseline Review

The Integrated Baseline Review (IBR) is a joint Contractor and Government assessment of the Project Management Plan (CDRL PM-01), and the Integrated Master Schedule (CDRL PM-03). The purpose of the IBR is to confirm that the performance measurement baseline covers the entire technical scope of work, that the work is realistically and accurately scheduled, that the proper amount and mix of resources are assigned to accomplish all contractual requirements, and that both the government and the Contractor understand and mutually agree to the nature and possible impacts of the risks associated with the program baseline.

The IBR process begins with an IBR Kick-Off meeting (usually via a telecon and WebEx) six weeks prior to the onsite IBR. Subsequent reviews of the developed schedule baseline and Earned Value Management (EVM) Performance Measurement Baseline (PMB) are conducted

remotely unless difficulties in generating these products are encountered then onsite reviews may be conducted. The IBR process concludes with an onsite IBR.

[SOW 215] The Contractor shall conduct an onsite Integrated Baseline Review (IBR) no later than 90 days after contract award.

[SOW 516] The Contractor shall prepare an Integrated Baseline Review (IBR) Data Package in accordance with CDRL PM-11.

[SOW 216] The IBR contents shall include the EVMS plan (CDRL PM-10), time phased expenditure plan, integrated master plan, integrated master schedule, resource loading, cost accounts, and work packages.

[SOW 217] The Contractor shall structure all plans, schedules, accounts, loading, and work packages according to the work breakdown structure.

[SOW 218] The IBR shall include a review of the Contractor's earned value assessment and reporting systems to assess system compliance with applicable standard and the degree to which actual Earned Value utilization tracks with system prescribed policies and practices.

[SOW 219] The Contractor shall plan for a four (4) day IBR, not including action item resolution.

[SOW 587] Six weeks prior to the onsite IBR the contractor shall deliver the Project Manager and Control Account Manager notebooks for review.

[SOW 588] The Contractor shall provide a mechanism for the Government to identify Areas of Concern prior to the onsite IBR.

[SOW 589] At the onsite IBR, the Contractor shall present plans to close all open Areas of Concern. Areas of Concern may be reviewed and closed via telecon prior to the onsite IBR.

3.13.3 Critical Milestone Reviews

Critical Milestone Reviews will be conducted for the purpose of assessing plans and performance at key decision points in the lifecycle. The reviews will be attended by an Integrated Independent Review Team to provide input to decision authorities in making a determination for the recommendation for continuation of the project.

[SOW 559] The Contractor shall provide technical and management leadership and support to all Critical Milestone Reviews.

[SOW 549] The Critical Milestone Reviews shall include only the following sequence of reviews:

Review	Notes
Systems Requirements Review (SRR)	The SRR examines the functional and performance requirements and the preliminary

	SGSS project plan and ensures that the requirements and the selected concept will satisfy the mission.
Mission Definition Review (MDR)	The MDR examines the proposed requirements, the mission architecture, and the flow down to all functional elements of the mission to ensure that the overall concept is complete, feasible, and consistent with available resources.
Preliminary Design Review (PDR)	The PDR demonstrates that the preliminary design meets all system requirements with acceptable risk and within the cost and schedule constraints and establishes the basis for proceeding with detailed design. It will show that the correct design options have been selected, interfaces have been identified, and verification methods have been described.
Critical Design Review (CDR)	The CDR demonstrates that the maturity of the design is appropriate to support proceeding with full-scale fabrication, assembly, integration, and test. CDR determines that the technical effort is on track to complete the flight and ground system development and mission operations, meeting mission performance requirements within the identified cost and schedule constraints.
System Acceptance Review (SAR)	The SAR verifies the completeness of the specific end products in relation to their expected maturity level and assesses compliance to stakeholder expectations. The SAR examines the system, its end products and documentation, and test data and analyses that support verification. It also ensures that the system has sufficient technical maturity to authorize its shipment to the designated operational facility or launch site
Increment and Full Operational Readiness Reviews (ORR)	The ORR examines the actual SGSS increment or SGSS characteristics and the procedures used in the system or end product's operation and ensures that all system and support (flight and ground) hardware, software, personnel, procedures, and user documentation accurately reflect the deployed state of the system.
Final Acceptance Review	TBD

This table supersedes the "Minimum Required Reviews" defined in NPR 7123.1A Systems Engineering Procedural Requirements.

[SOW 560] Critical Milestone Reviews shall meet the entrance criteria and success criteria as defined in NPR 7123.1A Systems Engineering Procedural Requirements.

[SOW 684] The Contractor shall conduct a dry run of each Critical Milestone Review, with Government representatives in attendance, approximately two (2) weeks prior to the review.

[SOW 685] The Contractor shall plan dry runs to be the same duration as the formal review.

[SOW 686] If the Government determines that delta reviews are required, the Contractor shall conduct such reviews at a time mutually agreed upon by the Government and the Contractor.

3.13.4 Project Reviews

This section describes other required project reviews.

3.13.4.1 Element-Level Reviews

[SOW 562] The Contractor shall conduct Software Requirements Reviews (SWRR), Preliminary Design Reviews (PDRs) and Critical Design Reviews (CDRs) for all project elements.

[SOW 563] With Government approval, the Contractor shall tailor entrance and success criteria for element-level reviews from the entrance and success criteria defined in NPR 7123.1A Systems Engineering Procedural Requirements.

[SOW 658] The contractor shall submit element SWRR Data Packages (CDRL RE-03), element PDR Data Packages (CDRL RE-06) and Element CDR Data Packages (CDRL RE-07).

3.13.4.2 Development Reviews

[SOW 564] For each development increment the Contractor shall conduct the following reviews: a System Integration Review (SIR), a Test Readiness Review (TRR) and a Mission Operations Review (MOR).

[SOW 565] The Contractor shall complete the increment SIR, TRR and MOR before delivery of the increment to the site.

[SOW 566] The Contractor shall complete a Post-Shipment Review (PSR) before the start of any additional verification for each increment received at site.

[SOW 567] With Government approval, the Contractor shall tailor entrance and success criteria for development reviews from the entrance and success criteria defined in NPR 7123.1A Systems Engineering Procedural Requirements.

3.13.5 Other Meetings

[SOW 235] In addition to the meetings required in this SOW, the Contractor shall support routine informational meetings and telecons with the government as necessary.

3.13.5.1 Scheduled Weekly Telecons

[SOW 236] The Contractor shall participate in a scheduled weekly telecon with the SGSS Project Office to communicate status, issues, and schedule progress and plans of the overall contract effort.

[SOW 237] The Contractor shall establish the meeting agenda and distribute documentation as required.

[SOW 238] The minimum Contractor attendance shall consist of the Project Manager and Systems Manager or the element technical lead managers.

[SOW 239] The Contractor shall provide detailed status, description of issues, and schedule for each major element of the contract.

3.13.5.2 Monthly Project Status Reviews (MPSR)

[SOW 244] The Contractor shall participate in face-to-face monthly project status reviews alternating between the Contractor's site and a Government site.

[SOW 245] The Contractor shall assume the Government site for MPSR meetings will alternate between NASA's Goddard Space Flight Center and the White Sands Complex.

[SOW 240] The Contractor shall communicate the status of the SGSS technical effort, schedule, and resource condition to the SGSS Project on a monthly basis.

[SOW 241] The Contractor shall develop and deliver a monthly project status review package, in accordance with CDRL PM-06.

[SOW 242] The monthly project status review package shall include Integrated Master Schedules (IMS) prepared in accordance with CDRL PM-03.

[SOW 246] The Contractor shall participate in splinter meetings with the Government in conjunction with each monthly project status review.

3.13.5.3 Technical Interchange Meetings and Working Groups

The Government will lead technical interchange and working groups as necessary to resolve program issues and other topics. Example groups include (but are not limited to) Systems Engineering, Software, Integration and Test (I&T), External Interfaces, Mission Operations, IT Security, Transition to Operations, User Interface and Communications Security (COMSEC).

[SOW 248] The Contractor shall participate in Government-led working groups.

[SOW 249] For planning purposes, the Contractor shall assume participation in up to ten (10) working groups, each requiring support equivalent to 5 person-days per month.

3.13.5.4 Yearly Coordination Meeting

The purpose of the yearly coordination meeting is for NASA and Contractor management teams

to define roles and responsibilities, plan coordinated activities, and capture and incorporate lessons learned for the SGSS effort.

[SOW 250] The Contractor shall support annual two day coordination and planning meetings.

[SOW 251] The agenda for these meetings shall be defined in advance by coordination between the Contractor and NASA Project Managers.

[SOW 253] The Contractor shall provide planning, facilities and facilitators.

[SOW 254] The location, schedule, and agenda of the annual discussions shall be coordinated with NASA.

3.14 Administrative Duties

This section describes the project administrative duties.

3.14.1 Personnel

[SOW 256] The Contractor shall provide human resources support to maintain a trained staff sufficient to perform all the functions described in this SOW at the required levels.

3.14.2 Inventory Database

[SOW 258] The Contractor shall provide and maintain an Inventory Database (CDRL CM-10).

[SOW 687] The Contractor shall use the Inventory Database (CDRL CM-10) to identify and account for Government property (including Government Furnished Property) in the possession of the contractor from the time the property is acquired until it is formally delivered.

[SOW 259] The Contactor shall affix government provided tags on all equipment as directed.

3.14.3 Secretarial, Clerical, and Administrative Support

[SOW 260] The Contractor shall provide any secretarial, clerical, and administrative support required for the execution of the contract.

4 System Engineering

[SOW 261] The Contractor shall perform a fully integrated systems engineering effort in accordance with the Contractor's System Engineering Management Plan (SEMP) (CDRL SE-01) and the applicable NASA requirements, as listed in 2.3 Applicable Documentation.

[SOW 264] The Contractor shall designate a Chief Systems Engineer to conduct and coordinate day-to-day systems engineering activities, oversee implementation of the Systems Engineering Management Plan (CDRL SE-01), and to act as the technical interface with the Government's systems engineering working group.

4.1 Requirements Analysis and Allocation

[SOW 265] The Contractor shall identify, derive, develop, and maintain requirements, including

traceability and verification approach, necessary to implement a design that meets Government requirements defined in the Level Three Requirements.

[SOW 266] The Contractor shall track and log all changes to requirements.

[SOW 267] The Contractor shall conduct analyses and simulations as necessary to fully establish, define, maintain, and control budget allocations for all required performance and design parameters.

[SOW 268] The Contractor shall define its Product Breakdown Structure (PBS) from the System Level (i.e., the total SGSS-delivered system) through major functional elements (e.g., Service Management, Space-Ground Link…) and any applicable lower intermediate levels to the Configuration Item level.

[SOW 629] The Contractor shall prepare and deliver the SGSS technical documents as shown in Figure 1 Technical Document Maturity Requirements.

	Requirements	Interfaces	Architecture/Design	ConOps
System Level	• System Req (CDRL SE-02); Final – SRR	• External IRDs (SE- 08) Preliminary – SRR, Final – MDR • External ICDs (CDRL SE-09); Preliminary MDR, Final - CDR	• ADD (CDRL SE-11) Preliminary – SRR, Final - MDR	• Ops Scenarios (CDRL SE-03) Final – Prior to SRR
Element Level (e.g., Service Mgmt)	• Element Req (CDRL SE-04); Preliminary – MDR, Final –PDR • Element SW Req (CDRL SE-05) – Preliminary MDR, Final Element PDR • Element HW Req (CDRL SE-06) – Preliminary MDR, Final Element PDR	• Internal IRDs (CDRL SE-27) Preliminary MDR, Final – PDR	• Element Architecture (CDRL SE-12); Preliminary – SRR, Final - MDR	• Element Scenarios Defined (CDRL SE-03) Preliminary – SRR; Final - MDR
Intermediate Level(s) - as appropriate	• Preliminary – MDR, Final-PDR		• Preliminary – MDR, Final - PDR	
Configuration Item Level Specifications	• Preliminary PDR, Final -CDR	• Internal ICDs (CDRL SE-28);Preliminary PDR, Final – CDR	• Software Design (SW-11), Database Design (SW-12), Hardware Design (SW-13); Preliminary Element PDR, Final – Element CDR	• CI Scenarios(CDRL SE-03) Preliminary – PDR, Final – CDR • Operational Procedures (CDRL MO-09) Preliminary - CDR

Figure 1 Technical Document Maturity Requirements

4.1.1 Tools

[SOW 269] The Contractor shall define and deploy, by System Requirements Review (SRR), a tool for requirement tracking and traceability.

[SOW 633] The requirement tracking and traceability tool shall provide export of the contents of the tool in a format that can be imported by Cradle (http://www.threesl.com).

[SOW 270] The Contractor shall provide remote electronic access to the requirements management tool and all levels of requirements data for Government-designated personnel.

4.1.2 Traceability

[SOW 271] The Contractor shall document the allocation of Government requirements as defined in the Level Three Requirements to lower level specifications, showing the traceability of all requirements including performance and design drivers, and explicitly identifying any derived requirements.

[SOW 272] The Contractor shall verify that lower level requirements are fully traceable to higher level requirements.

[SOW 273] The Contractor shall maintain traceability of the requirements to the verification method and specific test event.

[SOW 385] The Contractor shall maintain and update the Requirements Verification Traceability Matrix (CDRL SE-07) to include the status (pass, fail, deferred, etc.) of each requirement throughout the testing phases and various testing activities.

4.1.3 Changes to Requirements

[SOW 274] The Contractor shall work with the Government Mission Systems Engineer (MSE) and other entities as necessary to resolve any problems/issues associated with the SGSS requirements.

[SOW 276] All changes to the Level Three Requirements shall require Government approval.

4.2 Interface Definition, Allocation, Verification and Control

[SOW 278] The Contractor shall perform all systems analyses and systems engineering to define internal and external interface requirements specifications and develop interface control documents.

[SOW 279] The Contractor shall prepare and deliver the Updates to SN External Interface Requirements Document (CDRL SE-08), Updates to SN External Interface Control Document (CDRL SE-09), SGSS Internal Interface Requirements Document (CDRL SE-27), and the SGSS Internal Interface Control Document (CDRL SE-28).

[SOW 280] The Contractor shall verify and maintain the interfaces defined in CDRL SE-08, CDRL SE-09, CDRL SE-27, and CDRL SE-28 for the duration of the contract.

4.3 Design, Analysis, and Trades

[SOW 643] The Contractor shall complete a technology assessment study 1 year prior to the first release of the system and incorporate the latest version of functional CI's into the design of the system.

[SOW 282] The Contractor shall perform all Studies and Trades (CDRL SE-16) as necessary to develop the lower-level requirements and design of the SGSS.

[SOW 622] All requirement and design studies shall include (1) assessments of risks (2) assessment of life cycle costs, (3) potential cost savings achievable by reducing functional and performance requirements, (4) potential cost savings achievable by increased automation.

The objective of Make versus Buy studies is to identify areas where minor to moderate functional and performance requirements changes could result in significant cost savings.

[SOW 283] Where the Government deems appropriate, the Contractor shall include an assessment of Make versus Buy implementation approaches.

[SOW 284] At a minimum, Make vs. Buy studies shall (1) compare lifecycle costs of proposed solutions, (2) compare functionality and performance of proposed solutions, and (3) identify potential requirements tradeoffs that could be made for the purpose of decreasing total lifecycle costs.

4.3.1 Modeling and Simulation

[SOW 285] The Contractor shall prepare and submit a Modeling and Simulation Plan (CDRL SE-17) describing the planned model capabilities and their use for prototyping, emulation, and/or simulations that will be used to support design, concept validation, verification, Integration and test, training, and operations support.

[SOW 659] The Modeling and Simulation Plan shall include the identification and execution of simulation requirements to support design and development requirements

[SOW 286] The Modeling and Simulation Plan (CDRL SE-17) shall describe Contractor plans to integrate, test, validate and utilize the simulators.

[SOW 287] The Contractor shall prepare and submit Modeling and Simulation Analysis reports (CDRL SE-18) documenting the results of the modeling and simulation activities.

4.3.2 Performance Analysis and Budgets

[SOW 295] The Contractor shall develop performance budgets (including data throughput, data latency, and memory utilization), and maintain these through system acceptance.

[SOW 296] The Contractor shall present performance budgets, current margins and trending data at all system and element reviews.

4.3.3 Technical Studies

During the course of this contract, the Government intends to direct the Contractor to undertake various technical studies. Each study will be initiated by written direction from the Government Contracting Officer (CO). The Government will coordinate with the Contractor to define each study in detail, and establish manpower ceilings, performance schedules, and deliverables.

[SOW 165] The Contractor shall conduct technical studies and perform selected non-recurring studies related to SGSS as directed by the Government in accordance with the Special Studies procedures stated in this contract.

[SOW 167] The Contractor shall prepare and submit results of Technical Studies (CDRL TS-01).

4.4 System Engineering Reviews and Audits

[SOW 298] The Contractor's system engineering process shall include the reviews listed in this section. Additional reviews that the Contractor deems necessary to successfully execute the program, which do not negatively impact cost and schedule, may be conducted at the Contractor's discretion.

[SOW 301] For all reviews the Contractor's Systems Engineering organization shall ensure that:

1. Content requirements of the review are satisfied.
2. Entry and exit criteria are satisfied.
3. Appropriate notes and action items are recorded.
4. Action items are appropriately closed and the results are captured in the final meeting minutes.

4.4.1 Audits

[SOW 303] The Contractor shall provide access and support for both formal and informal Government audits of the Contractor's activities, processes, products, documentation and data in order to provide assurance to the Government that the program is being implemented according to all requirements and specifications.

4.4.2 Engineering Peer Reviews

[SOW 304] The Contractor shall define and implement a set of Engineering Peer Reviews (EPRs) throughout the development life cycle to identify and address risks, problems, and issues as they arise commensurate with the scope, complexity and acceptable risk of the product.

[SOW 305] The Contractor shall submit an Engineering Peer Review Plan (CDRL SE-21).

[SOW 306] The Contractor shall chair and host EPRs at the Contractor's facilities.

[SOW 613] The Government shall be notified ten (10) days in advance of all Engineering Peer Reviews.

[SOW 623] The Contractor shall provide support for the Government to participate in person or

remotely in all EPRs.

[SOW 666] The Contractor shall ensure that peer review teams include technical experts with experience relevant to the technology and requirements.

[SOW 307] The Contractor shall document EPRs in accordance with Engineering Peer Review Data Packages (CDRL SE-24).

[SOW 308] The Contractor shall systematically and comprehensively peer review the product at the individual element level and lower levels, as appropriate. Element and software design reviews are considered to be EPRs and subject to this procedure.

[SOW 309] The Contractor shall conduct peer reviews, as appropriate, over the lifecycle of each element and component, with content consistent with the evolving design and development.

[SOW 310] Applicable peer reviews shall be completed prior to and summarized at the corresponding SGSS milestone review (e.g. CDR). Successful completion of these reviews and resolution of associated technical issues and action items is considered to be an important aspect of entry criteria in the formal review process.

[SOW 311] The Contractor shall also use EPRs for the focused evaluation of concepts, designs, plans and processes associated with combinations of elements and system functions that cross traditional element or discipline boundaries.

[SOW 312] The Contractor shall conduct additional EPRs as directed by the Government.

[SOW 315] For any reuse of heritage software or hardware proposed for use on SGSS, the Contractor shall conduct an EPR to assess its performance and the validity of its use in SGSS.

5 Mission Assurance

[SOW 534] The Contractor shall implement a Safety and Mission Assurance program in compliance with the SGSS Mission Assurance Requirements document (see 2.3).

6 Science / Technology

[SOW 640] The Contractor shall develop a Technology Assessment (CDRL SE-27) which provides an evaluation and justification of all the technologies proposed for use in SGSS.

[SOW 368] The Contractor shall develop a Technology Development Plan (CDRL SE-10) for any proposed technology at Technology Readiness Level (TRL) 6 (as defined by NPR 7123.1A - NASA Systems Engineering Processes and Requirements Table G-19 - Technology Readiness Levels) or lower.

[SOW 369] The Contractor shall manage the technology development of any technologies below TRL 6 to at least TRL 6 and include the development program in their risk management and program reporting activities.

7 Ground System Design and Implementation

7.1 Facilities

[SOW 420] The Contractor specify in the Site Survey (CDRL IT-05) the requirements (power, space, cooling) for the modifications to existing NASA facilities (e.g., WSC) or new facilities as necessary to meet the requirements of this contract.

[SOW 421] The Contractor shall ensure that the Site Survey requirements comply with NPR 8820.2E (Facility Project Implementation Guide) and NPR 8820.2F (Facility Project Requirements) for development, design, construction, and activation of an SN domestic and non-domestic facilities.

7.2 Hardware Design and Construction

[SOW 660] The Contractor shall use commercial off-the-shelf (COTS) hardware unless the contractor can demonstrate the lifecycle cost, risk, and technical factors supporting a non-COTS solution are in the best interest of the Government.

[SOW 661] The Contractor shall use Government approved quality control procedures as cited in the SGGS MAR document.

[SOW 662] The Contractor shall provide all items necessary to ensure proper operation of all hardware provided.

[SOW 688] The Contractor shall create a SGSS Hardware Design Description (CDRL HW-01).

[SOW 689] The Contractor shall create a SGSS Element Hardware Requirements Specifications (CDRL SE-06) and a Hardware Element Design Description (CDRL HW-02) for every element.

[SOW 593] The Contractor shall deliver engineering drawings as necessary (CDRL SE-22).

[SOW 594] The Contractor shall deliver an engineering drawing tree indexing all engineering drawings (CDRL CM-04).

[SOW 690] The Contractor shall use proven technology, proven vendors, and COTS hardware to the maximum extent possible to minimize cost and implementation risk.

[SOW 691] The Contractor shall produce designs with supporting rationale (e.g. documentation, information, analysis, prototype testing, demonstrations, etc) that identify how requirements will be satisfied.

[SOW 692] The Contractor shall identify, conduct and document hardware design trades (CDRL TS-01).

[SOW 693] The Contractor shall characterize design interfaces with their function and performance.

7.3 Software Design and Implementation

[SOW 371] The Contractor shall document in the Software Development and Management Plan (SDMP) (CDRL SW-01) the software management approaches and processes for software analysis, design, development, documentation, version control, test, validation, risk management, metric collection, and assurance of all software products.

[SOW 372] The Contractor shall adhere to the SDMP.

[SOW 694] The Contractor shall create a SGSS Software Design Description (CDRL SW-11).

[SOW 695] The Contractor shall create a SGSS Element Software Requirements Specifications (CDRL SE-05) and a Software Element Design Document (CDRL SW-10) for every element.

[SOW 663] The Contractor shall employ a source code version control tool to maintain revision control on all software requirements, design, source code, data, and documentation.

[SOW 696] The Contractor shall implement a consistent set of software development tools to support software development for all elements.

7.3.1 Software Verification and Validation

[SOW 631] The contractor shall prepare and submit a Software Master Build Plan (CDRL SW-19) to describe the integration and verification of the software.

[SOW 568] The Contractor shall ensure that all software faults are identified, documented and resolved.

[SOW 373] The Contractor shall assure that software fault tolerance and redundancy have been specified and implemented correctly, and verified by testing in accordance with the SGSS Verification and Validation Plan.

[SOW 375] The Contractor shall establish a repository for software and system metrics to document, monitor, analyze and track software and system metrics during each stage of development and across development and operational phases.

[SOW 376] The Contractor shall include in the software metrics the collection and classification of software defects including design and unit test defects.

[SOW 377] The Contractor shall perform trend analysis on the software defects and make the analysis results available for lessons learned and root cause analysis.

7.3.2 Software Problem Reporting and Corrective Action

[SOW 379] The Contractor shall provide for a corrective action process that tracks every software nonconformance to its final disposition.

[SOW 378] The Contractor shall create Discrepancy Reports (DRs) (CDRL PM-17) to identify, classify, track, report and correct software non-conformances and software test failures

throughout the development lifecycle.

7.4 Database Development and Implementation

[SOW 697] The Contractor shall create a SGSS Database Design Description (CDRL SW-12).

[SOW 380] The Contractor shall maintain a process and procedures for database development.

[SOW 381] The database development process shall include activities such as internal reviews, walkthroughs, providing status, test, and discrepancy resolution.

[SOW 382] The Contractor shall:

a. Utilize a process for the verification and validation of the database system.
b. Ensure that system/software releases and database releases are coordinated with one another.
c. Implement CM on the database system to ensure that the database release version is defined and documented, controlled and that the integrity of the dataset contained within is controlled.
d. Ensure that security measures are implemented on the database system and on the data contained within the database system.

7.5 Independent Verification and Validation

The Government will perform an independent verification and validation of the SGSS system. This effort will be performed by the NASA IV&V Team, which may include third-party contractors.

[SOW 667] The contractor shall allow NASA IV&V review and participation before final product delivery to the Government.

[SOW 342] The Contractor shall ensure that all documentation and code required for the independent verification and validation effort is made available to the NASA IV&V team. This includes but is not limited to all reviews and reports, developer plans and procedures, software code, design documentation, and problem reporting data.

[SOW 344] The Contractor shall provide the required IV&V information via the electronic library.

[SOW 343] A Contractor point of contact (POC) shall be assigned and available to the NASA IV&V Team, as required, for questions, clarification, and status meetings. For planning purposes, the POC is assumed to be a senior system engineer.

7.6 Technology Refresh

[SOW 548] The Contractor shall develop and deliver a Technology Refresh and Sparing Plan (CDRL SE-25).

[SOW 668] The Contractor shall implement the Technology Refresh and Sparing Plan (CDRL SE-25) for the Period of Performance of this contract.

8 Systems Integration, Test, Verification and Installation

[SOW 463] The Contractor shall be responsible for implementation of a full integration, test, verification and installation program.

[SOW 669] The contractor shall be responsible for ensuring the performance and readiness of the SGSS for satellite operations.

[SOW 670] The contractor shall provide all necessary hardware and software to accomplish integration and testing.

8.1 I&T Management

[SOW 383] The Contractor shall ensure that test personnel attend and participate as necessary in all reviews throughout the lifecycle, including requirements, architecture, and design reviews.

[SOW 388] The Contractor shall perform the necessary changes to resolve integration and test problems.

[SOW 387] The Contractor shall create Discrepancy Reports (DRs) (CDRL PM-17) to identify, track and resolve any integration or test problems, starting at PDR and continuing through integration and test and operations and sustainment.

[SOW 671] The contractor shall ensure that the I&T Plan (CDRL IT-01), Performance Verification Plan (CDRL SE-19), and Transition and Operations Support Plan (CDRL MO-01) are consistent and provide a complete set of activities necessary to deploy, install, and ensure readiness of the SGSS to support operations

8.2 I&T Equipment and Engineering

[SOW 391] The Contractor shall provide all necessary hardware and software to accomplish system-level integration and testing.

8.3 I&T Plans and Procedures

[SOW 392] The Contractor shall prepare, submit, and implement an Integration and Test Plan (CDRL IT-01) addressing all integration activities.

[SOW 393] The Contractor shall prepare, submit, and implement Detailed Test Plans and Procedures (CDRL IT-02) to support Integration and Test activities identified in the Integration and Test Plan.

8.4 Test Data

[SOW 394] The Contractor shall incorporate Government-provided test cases, test scenarios, test data (TBP) in their verification activities.

[SOW 395] The Contractor shall provide test data for Contractor test and verification efforts when such data is not provided by the Government.

8.5 I&T Records

[SOW 397] The Contractor shall record test data, conduct post-test analysis and prepare and submit Post Test Data Packages (CDRL IT-04) to report as run procedures, test results, requirements verification status, and discrepancy resolution.

[SOW 398] The Contractor shall coordinate post-test analysis to develop requirements verification status, discrepancy resolution, and consolidated test results.

8.6 Regression Testing

[SOW 399] The Contractor shall define and execute a regression test set for each phase of testing (e.g., factory, site, and operational configurations) for all modified and mission critical capabilities.

[SOW 454] When delivering to an operational site, the Contractor shall conduct regression testing to verify that the delivery does not impact previously-verified functions and performance.

[SOW 672] The Contractor shall test any reused or heritage hardware or software to verify that it meets the requirements of the SGSS system.

8.7 Software Testing

[SOW 436] To support software test the Contractor shall:

1. Prepare, submit, and implement a Software Test Plan (CDRL SW-02) that describes the total software testing program.
2. Prepare, submit, and implement Detailed Software Test Plans and Procedures (CDRL SW-03)
3. Prepare and submit Software Test Reports (CDRL SW-04).

8.8 Hardware Testing

[SOW 698] To support software installation and test, the Contractor shall:

1. Prepare, submit, and implement a Hardware Test Plan (CDRL HW-03) that describes the total hardware testing program.
2. Prepare, submit, and implement Detailed Hardware Test Plans and Procedures (CDRL HW-04)
3. Prepare and submit Hardware Test Reports (CDRL HW-05).

8.9 External Interface Testing

[SOW 673] The contractor shall work with the SGSS Project to identify and execute early interface compatibility testing.

[SOW 437] The Contractor shall support interface testing and test data requests from external interface organizations as approved by the Government.

[SOW 438] The Contractor shall perform testing in conjunction with external organizations to

verify external interface functions and performance.

8.10 Factory Integration and Test

[SOW 439] All requirements and interfaces shall be verified at the factory on the operational hardware prior to delivery, installation, and official verification at an operational site.

[SOW 440] The Contractor shall integrate and test each requirement (hardware or software), including interfaces, prior to shipment from the factory, including regression testing with the previously-shipped requirements.

[SOW 441] The Contractor shall factory-test software to be delivered on an environment that is, with respect to function, configuration, and complexity, representative of the operational environment, to support determination of readiness for site installation.

[SOW 674] The contractor shall perform development testing on all procured hardware and software to verify capabilities prior to integration or other required testing.

8.11 Site Preparation

[SOW 443] The Contractor shall perform a Site Survey (CDRL IT-05) and document the current infrastructure and facilities.

[SOW 444] The Contractor shall identify, document, and justify in the Site Survey (CDRL IT-05) all facility requirements (including a schedule and any required deadlines) to implement the SGSS design including, but not limited to:

1. Floor space
2. Heating, Ventilation, and Air Conditioning (HVAC)
3. Power
4. Safety
5. Security
6. Existing hardware/software.

[SOW 445] The Contractor shall recommend solutions in the Site Survey (CDRL IT-05) for any shortfalls in required versus available facility and infrastructure resources.

[SOW 451] The Contractor shall perform all pre-operational work (e.g., installation, integration, testing, verification) in a manner that does not interfere with operational systems.

8.12 Site Installation

Following each installation event at a site, the Government will use the installed version of the system for operations preparation activities (e.g., training, procedure development) and thus will require a stable configuration of the system.

[SOW 442] The Contractor shall coordinate installation and checkout activity schedules with the Government, in order to ensure periods of stable GS configuration for training and operations preparation activities.

[SOW 709] The Contractor shall conduct installation and testing activities without impact to ongoing operations.

[SOW 710] The Contractor shall plan install and test for one SGL antenna system at a time, unless otherwise approved by the Government.

[SOW 699] The Contractor shall obtain Government approval for activities at any Government site in advance of the need date.

[SOW 447] The Contractor shall coordinate all site installation schedules and procedures with the SGSS Operations Manager and the Site Facility manager.

[SOW 448] The Contractor shall install the SGSS hardware and software items at each operational site, after ensuring, prior to each installation, that the site is ready.

[SOW 449] The Contractor shall provide all installation checklists, procedures, equipment, software, and tools.

[SOW 450] The Contractor shall perform all installation work in accordance with industry codes and ordinances.

[SOW 700] To support software installation the Contractor shall:

1. Prepare, submit, and implement a Software Installation Plan (CDRL SW-05).
2. Prepare and submit Software Release Delivery Package(s) (CDRL SW-06).
3. Prepare and submit Software Version Description(s) (CDRL SW-09).

[SOW 701] To support hardware installation the Contractor shall:

1. Prepare, submit, and implement a Hardware Installation Plan (CDRL HW-06).
2. Prepare and submit a System Hardware Configuration (CDRL HW-07).

8.13 Site Integration and Test

[SOW 453] The Contractor shall plan and conduct all testing necessary to verify that the system as installed at the operational sites meets the requirements allocated to each delivery as defined in the Program Management Plan (CDRL PM-01).

[SOW 456] The Contractor shall prepare and submit Operational Readiness Review Data Package(s) (CDRL IT-07).

[SOW 457] The Contractor shall conduct an Operational Readiness Review for each release.

[SOW 458] The Contractor shall plan on three (3) days for each Operational Readiness Review.

[SOW 459] The Contractor shall test integrated Government-furnished elements in order to support verification and acceptance.

[SOW 460] If site testing determines that a requirement verified for a prior delivery is impacted by a subsequent delivery, the Contractor shall change the verification status of that requirement to reflect the current status.

8.14 Formal Test Events

[SOW 461] The Contractor shall support the formal test events defined in the SGSS Verification and Validation Plan.

[SOW 232] The Contractor shall conduct formal data reviews following completion of a formal test event to ensure that the test data verifies required performance/functionality and to review all anomalies.

8.14.1 Test Readiness Reviews (TRR)

[SOW 229] The Contractor shall conduct a formal Test Readiness Review (TRR) at least 5 calendar days prior to all formal test events.

[SOW 230] The TRR shall review the readiness of the operational equipment, operational procedures, test documentation and test data.

[SOW 231] The TRR shall also review the configuration of the article under test and the status of all outstanding anomalies.

9 Verification and Validation

9.1 Design and Performance Verification

[SOW 290] The contractor shall establish a SGSS Performance Verification Plan (CDRL SE-19) that complies with the SGSS Verification and Validation Plan.

[SOW 630] The contractor shall ensure that the SGSS Performance Verification Plan documents the overall verification plan, implementation, and result to provide traceability from the system requirements document to deliverable capabilities.

[SOW 291] The Contractor shall develop and maintain all plans and procedures to verify that the system meets all Level Three Requirements.

[SOW 294] The Contractor shall prepare and submit SGSS Performance Verification Reports (CDRL SE-20) reporting the results of all verification activities.

9.2 NASA Independent Test

As part of the Government's verification and validation effort, the Government intends to conduct independent tests of the SGSS system. The timing and extent of the independent test effort will be determined based upon the Contractor's proposed solution and transition plan. The independent test effort will begin when the contractor ships the SGSS systems or any increment of the system to the site and completes a post shipment test.

[SOW 636] The Contractor shall provide support to the independent test in accordance with the Government's SGSS Verification and Validation Plan.

[SOW 702] The Contractor shall coordinate usage schedules for all installed components with the Government to ensure that there is sufficient availability for independent test activities.

[SOW 638] The Contractor shall ensure that all documentation and code required for the NASA Independent Test effort is made available to NASA Independent Test team. This includes but is not limited to all software reviews and reports, developer plans and procedures, software code,

software design documentation, and Discrepancy reporting data.

[SOW 639] The Contractor shall provide required IV&V information via the electronic library.

[SOW 640] A Contractor point of contact (POC) shall be assigned and available to NASA Independent Test personnel, as required, for questions, clarification, and status meetings. For planning purposes, assume a level of effort equal to four hours per week by a senior systems engineer.

[SOW 634] The Contractor shall provide resolution of any Discrepancy Reports resulting from the NASA independent test in accordance with the table below.

Severity category	Response Time
I	Two business days
II	Five business days
III	Next release
IV	Next release

9.3 Acceptance

[SOW 614] Final acceptance of the SGSS system shall occur upon the successful completion of the Final Acceptance Review (FAR).

10 Mission Operations and Maintenance

10.1 Concept of Operations

[SOW 472] The Contractor shall perform all work necessary to develop the SGSS Project concept of operations for all phases and modes, derive requirements for operational products, and to develop, verify and deliver all required operational products.

[SOW 625] The Contractor shall cooperate and coordinate with the WSC O&M Associate Contractor staff on the development of all operational products.

[SOW 473] The Contractor shall prepare and submit (CDRL SE-03) a SGSS Concept of Operations (ConOps).

[SOW 474] The Contractor shall develop all normal, maintenance, and contingency operations procedures and products required for NASA to operate the SGSS system following acceptance.

[SOW 517] The Contractor shall develop a Operations Handbook (CDRL MO-07) and an Operations and Maintenance Manual (CDRL MO-08).

[SOW 514] The Contractor shall prepare and submit Mission Operations Procedures (CDRL MO-09) and Contingency Operations Procedures (CDRL MO-10).

10.2 Transition to Operations

While SGSS installation, integration, and testing are part of achieving operational readiness, the

Transition to Operations classification includes the remaining efforts: the non-I&T activities that lead to full operational readiness and all sustainment activities following the transition to operations. Examples of such Government activities are: operator training and certification, user training and preparation, mission simulations and rehearsals, post-launch testing, shadow operations and satellite and ground operations. The Contractor support to these Government activities includes the following:

[SOW 644] As part of the Operations Handbook (CDRL MO-07), the Contractor shall provide a mapping of all existing SNGS operational procedures to SGSS procedures.

[SOW 645] The Contractor shall convert all existing SNGS spacecraft operational data to the SGSS system to ensure data continuity for trending and analysis.

[SOW 675] The Contractor shall convert existing SNGS ground system operational data related to reused or heritage components to the SGSS system to ensure data continuity for trending and analysis.

[SOW 676] The Contractor shall verify that all converted operational data provides identical trending and analysis results.

[SOW 468] The Contractor shall implement the transition to operations according to the Transition and Operations Support Plan (CDRL MO-01).

[SOW 569] The Transition and Operations Support Plan (CDRL MO-01) shall include a shadow operations testing effort.

[SOW 632] The contractor shall prepare and submit a Software Transition Plan (CDRL SW-20) which identifies the hardware, software and other resources needed for life cycle support of the deliverable software.

[SOW 677] The contractor shall provide a list of the specific SGSS Hardware Design Description (CDRL HW-01) and the Software Version Description (CDRL SW-09) for each Delivery.

[SOW 570] The first operational delivery and integration to WSC shall be the Maintenance Training Facility (MTF).

[SOW 470] The MTF shall include the final software development environment with all tools, libraries, software, test data, models/simulators, and documentation used in the development of SGSS.

[SOW 571] For all subsequent operational deliveries to WSC, the Contractor shall verify the delivery on the WSC MTF prior to transition to operations.

[SOW 572] For each operational delivery to WSC the Contractor shall repeat the Pre-Ship Review (PSR) tests in the WSC environment to ensure the system operates as required.

[SOW 469] The Contractor shall deliver all developed source and executable code to the

Government (CDRL SW-06).

[SOW 573] The Contractor shall transition the SGSS system into full operations without any impact to planned, scheduled or ongoing operations.

[SOW 575] The Contractor shall not transition Guam first.

[SOW 576] The contractor shall ensure the capability to operate indefinitely at any step in the transition.

[SOW 678] The Contractor shall ensure the capability to fall back to the last stable configuration.

[SOW 577] The Contractor shall ensure that the SN is fully operational with its full complement of resources (e.g. user services, proficiency, etc.) at the completion of each transition phase.

[SOW 578] The Contractor shall cooperate and coordinate with the WSC O&M Associate Contractor staff on the development all operational basic GUI designs.

[SOW 579] At least two weeks prior to PDR, the Contractor will present draft operational basic GUI mockups to the WSC O&M Associate Contractor for comment and feedback.

[SOW 580] At least two weeks prior to CDR, the Contractor will present final operational basic GUI mockups to the WSC O&M Associate Contractor for comment and feedback.

[SOW 471] The Contractor shall assist in transitioning sustainment skills to Government-designated staff.

10.3 Maintenance

For this SOW, maintenance means: keep the delivered SGSS operational components operating and meeting all system requirements, replace software and hardware to meet availability requirements, perform configuration control and configuration management documentation.

[SOW 475] The Contractor shall perform all maintenance for all delivered, operational items through the Period of Performance.

[SOW 476] The Contractor shall resolve discrepancies identified and assigned to the Contractor, based on Government designated priority, through the Period of Performance.

[SOW 477] The Contractor shall perform maintenance and upgrades with Government coordination on a non-interference basis with operations.

[SOW 478] The Contractor shall support maintenance of operational interfaces.

[SOW 479] The Contractor shall contract for technical support as needed from third party vendors.

[SOW 480] The Contractor shall maintain and provide to the Government a complete list of all third party Service Level Agreements (SLAs) including contract numbers, contact information and service levels and expiration dates.

[SOW 481] The Contractor shall prepare, submit, and implement a Maintenance Plan (CDRL MO-02).

[SOW 482] The Contractor shall prepare and submit Maintenance Records (CDRL MO–03).

[SOW 483] The Contractor shall prepare and submit Software Maintenance Manuals (CDRL SW-07).

[SOW 484] The Contractor shall provide resources to conduct an orderly transition of sustaining engineering knowledge, processes, and tools to the Government or to a successor Contractor, beginning six (6) months (TBD) prior to the end of the Period of Performance.

10.3.1 Facilities Maintenance

[SOW 424] The Contractor shall be responsible for all facilities maintenance of new facilities procured by this contract throughout the Period of Performance.

[SOW 425] The Contractor shall be responsible for all facilities maintenance of modifications to existing facilities procured by this contract throughout the Period of Performance.

[SOW 426] All facilities maintenance provided by the Contractor shall be in compliance with NPR 8831.2D Facilities Maintenance Management.

10.3.2 Hardware Maintenance

[SOW 485] The Contractor shall perform hardware maintenance, including repair, on all equipment procured by this contract throughout the Period of Performance.

[SOW 486] The Contractor shall provide the resources, including tools, necessary to perform maintenance required to achieve the operational availability of the system, over the lifecycle of the system on a per-site basis.

[SOW 487] The Contractor shall provide all general purpose electronic diagnostic test equipment, special purpose test equipment (unique to SGSS), and all other items, such as specialized connectors, fixtures, power supplies, that are not included as part of the operational systems, but are required to perform maintenance of SGSS on a per-site basis.

[SOW 488] The Contractor shall provide the resources, including tools, necessary to perform all preventive maintenance activities required to achieve operational availability on a per-site basis.

10.3.3 Software/Firmware Maintenance

[SOW 489] The Contractor shall perform software/firmware maintenance required to meet the operational availability requirements of the system.

[SOW 490] The Contractor shall provide all source software code, compilers, compiler procedures and OTS software required to recreate the baseline software configuration.

[SOW 491] The Contractor shall retain full responsibility for software/firmware maintenance of all modules throughout the period of performance.

10.4 Sustaining Engineering

[SOW 615] For the period beginning with the Final Acceptance Review (FAR) until the end of the Period of Performance, the Contractor shall provide sustaining engineering support to the SGSS system.

The Government will direct the Contractor to perform sustaining engineering tasks. Each task will be initiated by written direction from the Government Contracting Officer. The Government will coordinate with the Contractor to define each task in detail, and establish manpower ceilings, performance schedules, and deliverables.

For informational purposes, these Government-initiated tasks are expected to include the following types of tasks:

1. Support operations of the SGSS. This support shall include but is not limited to supplying technical expertise to perform analyses, to review data, or to review changes to documentation.
2. Investigate anomalies of the SGSS and provide recommendations for resolution.
    a. For non-critical anomalies, the Contractor shall acknowledge notification of the anomaly and provide an initial action plan within 48 hours (TBD) of notification by the Government. A non-critical anomaly is one where degradation or failure does not impair mission performance in a manner that could jeopardize the health and safety of any NASA mission.
    b. For critical anomalies, the Contractor shall acknowledge notification of the anomaly and provide an initial action plan within 8 hours of notification (TBD) by the Government. A critical anomaly is one where degradation or failure could jeopardize the health and safety of a NASA mission.
3. Provide updates to SGSS software to provide new or improved capabilities requested by the Government, including technical documentation, installation procedures, validation procedures and back-out procedures.

[SOW 492] The Contractor shall perform tasks relating to the continued operational support of the SGSS, as authorized by the Government and in accordance with Contract Clause C.5, Government-Directed Sustaining Engineering Task Support.

10.5 Logistics Support

[SOW 493] The Contractor shall conduct and submit a Logistics Analysis (CDRL MO-04) of the system's logistic requirements to meet operational availability and other performance requirements.

[SOW 494] The Contractor shall base the Logistics Analysis on detailed failure tracking, reliability assessments, performance, and projection of future risk of failures.

[SOW 495] Based upon the Logistics Analysis (CDRL MO-04), the Contractor shall prepare, submit, and implement a Logistics Support Plan (CDRL MO-05).

[SOW 496] The Logistics Support Plan (CDRL MO-05) shall consider the utilization of the existing site logistics services.

[SOW 497] The Contractor shall procure spare equipment as identified in the Logistics Support Plan (CDRL MO-05).

[SOW 498] The Contractor shall implement any needed procedures or measures as identified in the Logistics Support Plan (CDRL MO-05).

[SOW 499] The Contractor shall develop a Recapitalization Plan (CDRL MO-06) for all system hardware.

[SOW 500] The Contractor shall implement the Recapitalization Plan (CDRL MO-06) on a non-interference basis with operations and the operations of other existing ground systems.

11 Training and Documentation

[SOW 501] The Contractor shall provide training for Government and Contractor personnel, who perform spacecraft mission operations and maintenance, scheduling, engineering, ground hardware/software maintenance, and help desk services, and training of operations and maintenance personnel in accordance with the SGSS Training Plan (CDRL TR-01).

[SOW 503] During the development phase, the Contractor shall conduct preliminary training courses to prepare Government and Contractor personnel for integration and test activities involving the system.

[SOW 504] The Contractor shall provide training and Training Documentation (CDRL TR-02) that covers all aspects of the system including, at a minimum:

- Newly deployed hardware/software
- Modifications to existing hardware/software
- New and modified interfaces
- Operations procedures
- Contingency/anomaly response procedures

[SOW 505] The Contractor shall provide a mixture of classroom presentation, computer based training, and hands-on training activities.

[SOW 703] Training shall take place at the operational locations.

[SOW 506] The Contractor shall provide a minimum of 20 hours [TBD] training per student for a minimum of 40 [TBD] students.

[SOW 507] The Contractor shall coordinate training of all personnel including those designated by the SGSS Project.

[SOW 508] The Contractor shall audio and video record all training classes for use by new employees or those who missed the training.

[SOW 509] The Contractor shall prepare and submit a System Wall Chart (CDRL TR-03).

[SOW 510] The Contractor shall prepare and submit Manuals including:
1. Software User Manuals (CDRL SW-08)
2. Computer Operator Manuals (TBD)
3. Computer Programming Manuals (TBD)
4. Firmware Support Manuals (TBD)

12 Government Furnished Property

The Government does not intend to provide any Government Furnished Property (GFP) to the Contractor. However, if the Contractor believes that specific GFP would reduce the cost, risk, etc., of this contract, the Contractor may propose specific GFP along with a supporting rationale for Government consideration.

13 Installation-Accountable Property and Services

The Government property described in the List of Installation-Accountable Property and Services will be made available to the Contractor on a no-charge basis for use in performance of this contract.

[SOW 582] Installation-Accountable Property and Services shall be utilized only within the physical confines of the NASA installation that provided the property.

[SOW 583] The Contractor shall establish and adhere to a system of written procedures for holding employees liable, when appropriate, for loss, damage, or destruction of Government property.

14 Options

14.1.1 Contract Option 1 – Remote Backup SNOC

Option 1 of this contract concerns the design and implementation of a Remote Backup Space Network Operations Center (RBSNOC). The government will provide a location within CONUS for the installation of the RBSNOC (TBS).

[SOW 595] The Contractor shall be responsible for the design and implementation of the RBSNOC.

[SOW 619] The RBSNOC shall meet all RBSNOC requirements as identified in the Level Three Requirements.

[SOW 620] The Contractor shall prepare an Option Management and Implementation Plan (CDRL PM-20).

[SOW 600] The Contractor shall deliver to the Government all operational RBSNOC hardware and software.

[SOW 601] The Contractor shall deliver to the Government operations procedures for the RBSNOC.

[SOW 602] The Contractor shall deliver to the Government documentation and user's manuals for the RBSNOC.

[SOW 605] The Contractor shall provide initial training on the operation of the RBSNOC system to a maximum of 20 [TBD] Government representatives.

[SOW 606] The Contractor shall support the Government during the installation and initial checkout of the RBSNOC.

14.1.2 Contract Option 2 - SNE East Upgrade

Option 2 of this contract concerns the design, implementation and installation of an SGSS system at SNE East Blossom Point, Maryland. This option, if executed, will replace the SGSS Interface [SOW 554].

[SOW 607] The Contractor shall be responsible for the design, implementation and installation of an SGSS system at SNE East Blossom Point.

[SOW 608] The SNE East SGSS system shall provide the same functionality as the SGSS systems installed at Guam.

[SOW 621] The Contractor shall prepare an Option Management and Implementation Plan (CDRL PM-20).

[SOW 610] The Contractor shall provide initial training on the operation of the SNE East SGSS system to a maximum of 20 [TBD] Government representatives.

15 Abbreviations and Acronyms

AC	Actual Costs
C&A	Certification and Accreditation
CADRe	Cost Analysis Data Requirement
CCB	Configuration Change Board
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CIIL	Configuration Item Identification List
CM	Configuration Management
CO	Contracting Officer
COMSEC	Communications Security
CONUS	Continental US
COTR	Contracting Officner's Technical Representative
CPR	Contract Performance Report
CRM	Continuous Risk Management
CSOPs	COMSEC Standard Operating Procedures

DR	Discrepancy Report
DRB	Discrepancy Review Board
DSS	Defense Security Service
DoD	Department of Defense
ECR	Engineering Change Request
EV	Earned Value
EVM	Earned Value Management
EVMS	Earned Value Management System
FAR	Final Acceptance Review
FIPS	Federal Information Processing Standards
GFP	Government Furnished Property
GPR	Goddard Procedural Requirements
GRGT	Guam Relay Ground Terminal
IBR	Integrated Baseline Review
IONET	Internet Protocol Operational Network
ITAR	International Traffic in Arms Regulations
LEO	Low Earth Orbit
MA	Mission Assurance
MAR	Mission Assurance Requirements
MDR	Mission Definition Review
MOR	Mission Operations Review
MPSR	Monthly Program Status Review
MTF	Maintenance Training Facility
NISN	NASA Integrated Services Network
NISPOM	National Industrial Security Program Operating Manual
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
NSA	National Security Agency
OPSEC	Operational Security
ORR	Operational Readiness Review
OTB	Over Target Baseline
PDR	Preliminary Design Review
PMB	Performance Measurement Baseline
PSR	Post-Shipment Review
PV	Planned Value
RBSNOC	Remote Backup Space Network Operations Center
RFP	Request for Proposal
RMP	Risk Management Plan
SAR	System Acceptance Review
SBU	Sensitive But Unclassified
SGSS	Space Network Ground Segment Sustainment
SIR	System Integration Review
SN	Space Network
SNGS	Space Network Ground Segment
SOW	Statement of Work
SPA	Single Point Adjustment
SRD	System Requirements Document
SRR	System Requirements Review

STGT	Second TDRS Ground Terminal
SWRR	Software Requirements Review
TBD	To Be Determined
TBR	To Be Resolved
TBS	To Be Supplied
TDRS	Tracking and Data Relay Satellites
TPI	Two Person Integrity
TRR	Test Readiness Review
WBS	Work Breakdown Structure
WSC	White Sands Complex
WSGT	White Sands Ground Terminal
I&T	Integration and Test
SEMP	System Engineering Management Plan
PBS	Product Breakdown Structure
MSE	Mission Systems Engineer
EPR	Engineering Peer Review
CI	Configuration Item
TRL	Technology Readiness Level
COTS	Commercial Off-The-Shelf
SDMP	Software Development and Management Plan
IV&V	Independent Verification and Validation
CONOPS	Concept of Operations
O&M	Operations & Maintenance
SLA	Service Level Agreement